Canyon Flies
(*Fannia benjamini* complex)

General Information

Canyon flies are significant pests of humans and animals in coastal mountain and foothill habitats of the southwestern United States. The canyon fly group is comprised of seven related fly species within the *Fannia benjamini* complex: *F. benjamini*, *F. conspicua*, *F. thelaziae*, *F. tescorum*, *F. operta*, *F. neotomaria*, and *F. arizonensis*. The geographic range of each of these fly species is unknown, though some overlap in range among species is recognized at a few locations where they have been studied. All flies in this group are attracted to animals to feed on body secretions such as tears, mucus, sweat, saliva, or blood from open wounds (Fig. 1). Their persistent attempts to land upon the face and body of the host can result in considerable nuisance.

Figure 1: Canyon fly feeding on human foot. Photo by Alec Gerry, UC Riverside.

Canyon flies are diurnally active, with host-seeking generally greatest soon after sunrise and in the hours before sunset. Where daytime temperatures are high, a pronounced lull in fly activity will be noted during midday. Little is known about the variation in activity among the canyon fly species, but those species that have been examined in California show a distinct seasonal activity with adult fly abundance peaking during late spring and early summer or in early-mid fall.

Identification and Life History

Canyon flies are small bodied, ranging in size from 3.5-4.5 mm. Only adult female canyon flies are attracted to and feed on animal hosts, from which they acquire proteins needed for egg development. Adult female canyon flies are distinguished by the yellowing of their antenna and palpi, and by their trimaculate (three spotted) abdomen (Fig. 2).

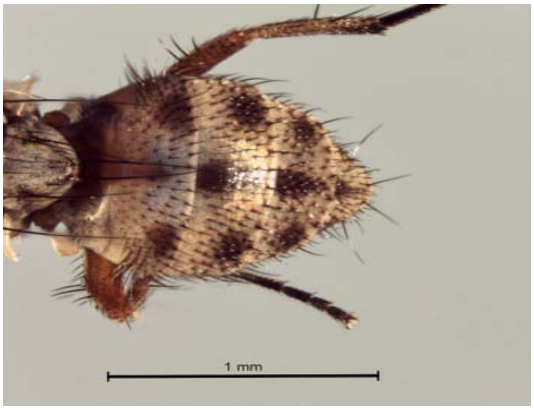

Figure 2: Canyon fly abdominal coloration (female). Photo by Stephanie Leon, UC Riverside.

Canyon flies have sponging mouthparts, like house flies, but also have prestomal teeth (Fig. 3) which they can use

to scrape a feeding surface (e.g., mucous membranes around the eyes) to encourage production of tears or other secretion. Near a human host, adult canyon flies have a characteristic flight behavior resulting in their

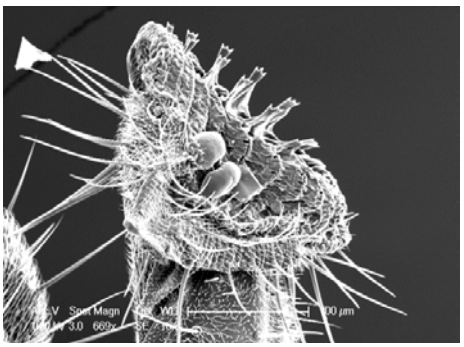

Figure 3: Prestomal teeth on *Fannia benjamini*. Photo by Panchali Ekanayake, UC Riverside.

hovering near the head, waist, feet, or other areas where sweat builds up, with landing typically occurring only when the host remains relatively still.

The development site for immature canyon flies is not well characterized. At least one species (*F. conspicua*) is known to utilize decaying vegetation as a developmental site, and large populations of this fly species are known to occur in southern California hillside communities where an exotic succulent groundcover plant called "red apple" (*Aptenia cordifolia*) has been extensively planted.

Figure 4: *Fannia conspicua* larva. Photo by Stephanie Leon, UC Riverside.

All flies undergo complete metamorphosis with egg, larva, pupa, and adult stages. Canyon fly larvae do not look like a typical fly maggot; instead they appear flattened and have numerous filaments extending from the body often with some feathering at the base of these filaments (Fig.4). The pupa develops within a puparium, which is the hardened outer skeleton ("skin") of the last larval instar. The canyon fly puparium retains the shape of the larva, but darkens to a deep brown as the pupa develops inside.

Damage

Only one member of the canyon fly complex (*F. thelaziae*) is known to pose a threat to human and animal health because it acts as an intermediate host of the nematode eye worm *Thelazia californiensis*. More typically, canyon flies cause nuisance to humans and our domestic animals through persistent attempts to land on the body and face of the host. This host-seeking behavior can severely limit human and animal use of outdoor areas that have large numbers of canyon flies.

Integrated Pest Management

Trapping: Although not typically blood feeders, canyon flies do respond to carbon dioxide (CO_2) which is a component of animal breath, and at least one species (*F. conspicua*) in the group is readily captured in CO_2-baited traps. The addition of ammonia, another host odor, to the CO_2 traps was shown to increase the capture rate of *F. conspicua*. Suction traps arrayed in a barrier and baited with CO_2 reduced the number of *F. conspicua* reaching the protected area and this management technique might provide relief from nuisance in some instances. However, not all canyon fly species are readily captured in suction traps baited with CO_2; the type species of the canyon fly group, *F. benjamini,* is not captured in CO_2-baited suction traps, even when traps are supplemented with additional host odors like ammonia and octenol.

Cultural Control: For at least one canyon fly species (*F. conspicua*) removal of larval development habitat could reduce the population considerably. The succulent groundcover "red apple" was introduced to California in the 1980s for hillside planting to prevent soil erosion and as a barrier against wildfire. Prior to the introduction of this exotic plant, *F. conspicua* numbers were low in the hillside communities of southern California and this fly species was not reported as a considerable nuisance. By the mid-1990s, "red apple" was planted widely in these hillside communities and *F. conspicua* began to utilize it as a development site (Fig.5). Reports of nuisance by *F. conspicua* rose quickly in subsequent years. It is likely that widespread removal and replacement of "red apple" with a suitable alternate plant would reduce canyon fly populations to their previous numbers.

Figure 5: Eggs of *Fannia conspicua* on "red apple" (*Aptenia cordifolia*). Photo by Alec Gerry, UC Riverside.

References for more information

Gerry, A. C. and B. A. Mullens. 2006. Adult canyon fly (*Fannia benjamini* complex) (Diptera: Muscidae) activity in southern California and use of CO_2 as an attractant. J. Med. Entomol. 43: 467-472.

Mohr, R. M, B. A. Mullens, and A. C. Gerry. 2011a. Diel patterns of female host seeking, male swarming, and sugar feeding in *Fannia conspicua* (Diptera: Muscidae) in southern California. J. Med. Entomol. 48: 188- 195.

Mohr, R. M, B. A. Mullens, and A. C. Gerry. 2011b. Evaluation of ammonia, human sweat, and bovine blood as attractants for the female canyon fly, *Fannia conspicua* (Diptera: Muscidae), in southern California. J. Vector Ecol. 36: 55-58.

Mullens, B. A. and A. C. Gerry. 2006. Life history and seasonal abundance of *Fannia conspicua* (Diptera: Muscidae) in southern California. J. Med. Entomol. 43: 192- 199.

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